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Evidence-based guidance to assist volunteers working with at-risk children in a school context

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ABSTRACT

Aim: One of the activities of the Belgian Red Cross is the 'Bridging the Gap' project, in collaboration with local schools. In this project, volunteers join the teaching staff to improve personal development goals in at-risk children with poor performance. The aim of this study was to develop evidence-based guidance for the volunteers to help them choose the right didactical approach for supporting these children.

Method: Systematic literature searches were performed in three bibliographic databases (the Campbell Library, MEDLINE and ERIC) to find the effectiveness of 16 different didactical activities. In addition, during a consensus meeting with relevant stakeholders, we discussed the applicability and meaningfulness of these activities for volunteers in the school context.

Results: We identified 38 relevant studies out of 12 056 references. Evidence of effectiveness was available for the following activities: book reading, road-safety education, number games, puzzle making, singing, block-building activities, reading poetry, computer-assisted instruction, storyboards, role play and a library visit. Based on the discussion with stakeholders, we developed evidence-based guidance with recommendations and suggestions to assist volunteers in their task.

Conclusion: This evidence-based guidance was developed to help volunteers working in a school context to choose which didactical activities to carry out with at-risk children, with the aim of improving the children's personal development. The list of didactical approaches we promote is not exhaustive and will most likely continue to grow, as many activities are currently not (well) described in scientific studies. In addition, contextual factors that may play a role in the success or failure of certain didactical activities are also subject to change.

Key words: at-risk children, didactical activities, evidence-based practice, schools, voluntary support

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Background

Inequality in educational performance exists among school children in many rich industrialized nations.[1] In Belgium, the performance gap between low achievers and average students is one of the biggest in the world. Several factors are associated with this gap, including for example occupation, education and economic status of the children's parents. In addition, some schools teach a large proportion of nonnative children, who are found to perform less well than their native peers.[1] Changing circumstances, such as a divorce or the loss of a relative, may also affect children's ability to learn and places them at risk.[2,3]

To minimize the performance gap, some at-risk children could benefit from additional support.[4] Where parents are unable to support their children[5] or to afford professional help, voluntary organizations might be able to assist and deliver such support in schools. In this article, we present the 'Bridging the Gap' project of the

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Belgian Red Cross. It promotes the involvement of adult community volunteers in support programmes for at-risk children at the request of the school and provides guidance on which educational interventions or activities ought to be considered.

One of the aspects that needs to be taken into account in the development of such guidance for volunteers is the 'proven effectiveness' of support activities, based on the latest and best available scientific evidence.[6] This idea has been promoted by the Evidence-Based Medicine or Practice movement.[7] Several nonprofit organizations have been launched since the early 1990s, with the aim of producing and disseminating systematic reviews of high-quality evidence, including Cochrane (cochrane.org), the Campbell Collaboration (Campbellcollaboration.org) and the Joanna Briggs Institute (Joannabriggs.org). Systematic reviews have proven to be a worthwhile ingredient in the development of practice guidelines.[8] In the field of education, high-quality systematic reviews have been used to support educational policy and practice decision-making processes, as part of the Evidence-Based Education movement.[8–10] Also in social work and care, there is a need to make better connections between primary research and practice to support the most vulnerable in society.[11]

Aim

We developed evidence-based guidance that will assist community volunteers in choosing the most appropriate didactical activities when providing support to at-risk preschool and primary school children. This aim was achieved by conducting a systematic literature review to identify which of the 16 preselected educational activities are effective in terms of personal development outcomes of the target group children and by discussing the applicability and meaningfulness of these activities for community volunteers in the school context. We will illustrate the process of guidance development with two specific examples.

Methods

We first provide a definition for what we call 'at-risk children' in this article. Without claiming to be comprehensive, the following factors have been identified as placing children at risk: a low socioeconomic status, being nonnative, being disabled, the loss of a family member, a divorce of the child's parents and any other factor that makes children more vulnerable. Evidence shows a clear link between vulnerability and poor performance in school.[1–3]

To develop evidence-based guidance, we used the criteria outlined in the instrument for Appraisal of Guidelines for Research and Evaluation (AGREE II). This instrument defines six relevant domains that should be taken into account when developing evidence-based guidance: scope and purpose, stakeholder involvement, rigour of development (focusing on the systematic literature search supporting the guidance), clarity of presentation, applicability and editorial independence.[12] When developing the guidance, we followed the recommendations provided by the AGREE instrument for each of these domains.

Step 1: systematic literature review

Discussion with stakeholders to select educational activities

To select educational activities that could be delivered by volunteers, a discussion round was held with didactical experts, teachers, Red Cross staff responsible for the 'Bridging the gap' project, and volunteers. Based on this discussion, the following 16 activities were initially selected as being relevant for inclusion in the systematic literature review: book reading, computer-assisted instruction, craftwork, indoor and outdoor kids games, poetry reading or storytelling, puzzle making, puppetry, doll as didactical tool, road-safety education in practice, role play, singing, free expression, low-intensity sports activities (walking, cycling), storyboards, block-building activities and visit to a library. The relevance was determined based on the applicability or fit-for-purpose level of the activity in the school context. We searched the literature to identify articles in which any of these 16 predefined activities were evaluated.

Search strategy to identify the best available evidence

The literature searches were performed in March–April 2013. We searched the Campbell Library to identify previously published systematic reviews in the fields of social science, social welfare and education. In addition, MEDLINE (via the PubMed interface) and ERIC (via the EBSCOhost interface) were searched to identify potential relevant systematic reviews, controlled experimental studies and observational studies. Separate search strings for each of the 16 activities were developed by one methodological expert, and feedback from two content experts was incorporated. Selection of evidence was performed by one reviewer. Key search terms included in the search strategy to describe the population were several terms describing 'children' or 'schools', which is broader than 'at-risk children', as we anticipated that only a minority of studies would have included at-risk children. Key search terms to describe the intervention were

activity-specific search terms such as 'books', 'reading', 'computer-assisted education', 'educational game', 'poetry', 'puzzle', 'puppet', 'road safety education', 'role play', 'singing' or 'storyboard'. We chose activity-specific search terms as it was anticipated that studies would investigate specific activities rather than a group of didactical activities and as it was chosen to develop separate search strategies for each of the activities. Alternative search terms and spelling were used as much as possible. The search strategies for 'block-building activities' and 'storyboards' are provided as an example in Appendices 1 and 2.

Selection criteria for study selection

Type of population: in order for studies to be included, the target group described in the studies had to represent at-risk preschool or primary school children (for definition, see above), with poor performance in school (knowledge, skills, attitude). Studies that lacked detailed information about the children's socioeconomic status and abilities, but where we could reasonably assume that such children were included in the target population, were also selected. Studies targeting children with disabilities, such as deaf or visually impaired children, were excluded from the review.

Type of activities: we included studies reporting on didactical activities delivered by trained or untrained volunteers. Evidence describing a didactical intervention performed by parents, (former) teachers or other professionals was only considered for inclusion when there was no direct evidence available from volunteers for the activities under study and the context in which the activities were delivered matched the context the studies with volunteers reported on.

Type of outcomes: we considered the following personal development outcomes: knowledge, skills, attitude and behaviour. In the context of this article, we defined personal development as the process of improving others' competencies through activities such as training, mentoring, tutoring or coaching. Motor skills were excluded as an outcome.

Type of study designs: we included quantitative research studies featuring experimental or observational designs with an appropriate control group (or within subject design with a baseline measurement as control). Only when no experimental studies were found were observational studies retained for analysis. The control group was defined as follows: children who received no intervention (or a baseline measurement in a before–after study) or another included intervention; children who received an intervention without instruction by an adult (indirect evidence).

Studies written in English, French, German or Dutch were analysed, irrespective of publication year.

Based on the above-mentioned predefined selection criteria, studies were selected by one independent reviewer who screened the titles and abstracts of all the retrieved references. Thereafter, evaluation of full texts to further exclude irrelevant references was performed. We also searched the reference lists of all selected studies and checked the related articles displayed in MEDLINE (limited to the first 20 references).

Data extraction and quality assessment of the evidence reported

We extracted the following descriptive data from the included articles: methodology used, type of participants, type of intervention, type of comparison and type of outcomes. These were extracted and documented in evidence summaries. Numeric data were extracted as means for continuous data and risks for dichotomous data. Where possible, the effect measure was provided as mean difference for continuous data, and odds ratios or risk ratios for dichotomous data. In addition, an assessment of the quality of the evidence was performed according to the GRADE (Grading of Recommendations Assessment, Development and Evaluation) approach. This method takes into account limitations in study design, inconsistency, indirectness (of population, intervention or comparison) and imprecision.[13] The quality of evidence was defined as high, moderate, low or very low and reflects the degree of confidence that the estimates of an effect are adequate for supporting a particular decision or recommendation.[13] This evidence base was produced to facilitate discussion on the content of the guidance for volunteers with the expert panel.

Step 2: discussion with stakeholders

A multidisciplinary panel of external experts was put together, including experts with teaching or didactical experience or experience in working with the target group (i.e. at-risk children in Flanders, Belgium). The expert panel members had one of the following profiles: policy maker in the field of education, schoolteacher, teacher trainer or volunteer in the 'Bridging the Gap' project of the Belgian Red Cross.

A descriptive summary of the results from the literature study was taken into consideration by the expert panel during a 4-h consensus meeting held in July 2013. We presented the panel with the overview of didactical activities supported by evidence. We then discussed the activities' applicability and meaningfulness. We assessed whether the evidence-based activities could be provided by a volunteer (e.g. without formal educational

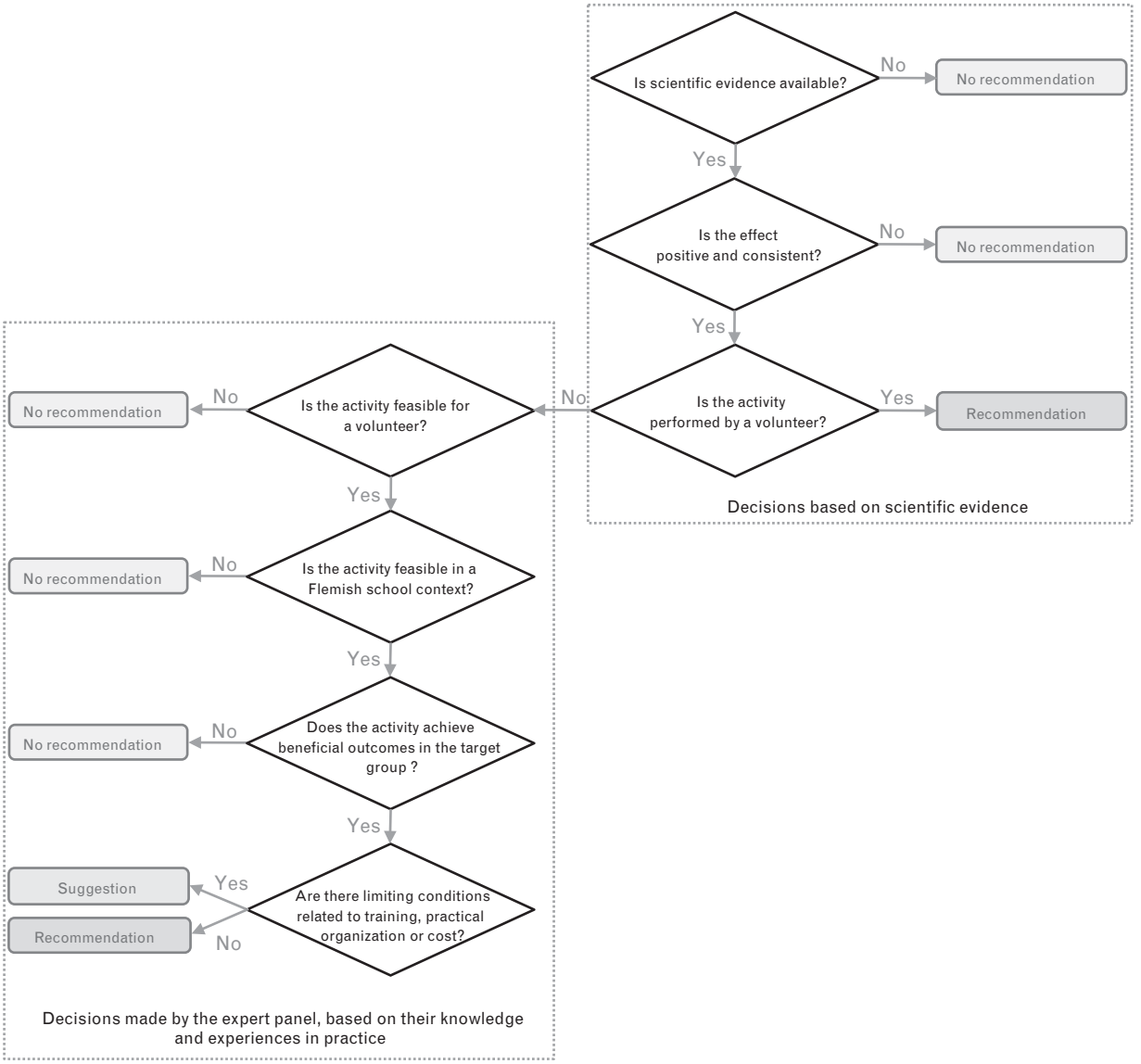

Figure 1. Decision tree used during the consensus meeting by the expert panel to formulate final recommendations.

certification), the feasibility of the activity within the school context, the potential of the activity to achieve beneficial outcomes in the target group, the presence or absence of specific conditions that may affect the success or failure of the activities (such as training, resources and funding) and the perceived value of each of the activities in relation to these different dimensions. The process of this discussion was guided by a decision tree developed by the Chair (K.H.) of the consensus meeting (Fig. 1). The expert panel formulated its conclusion as a 'recommendation' when there were no barriers or obstacles related to the further implementation of the activity. In contrast, when such barriers were identified for particular activities, the panel formulated its conclusion as a 'suggestion'.[14] Following the consensus meeting, two external reviewers evaluated the draft recommendations for clarity, applicability and feasibility. Thereafter, their feedback was incorporated into the final version of the guidance. The peer reviewers declared that they had no conflicts of interest. All panel members approved the final guidance.

Results

Systematic literature review to identify the best available evidence

The literature search yielded 12 056 records. Initial screening, based on evaluation of the title and abstract,

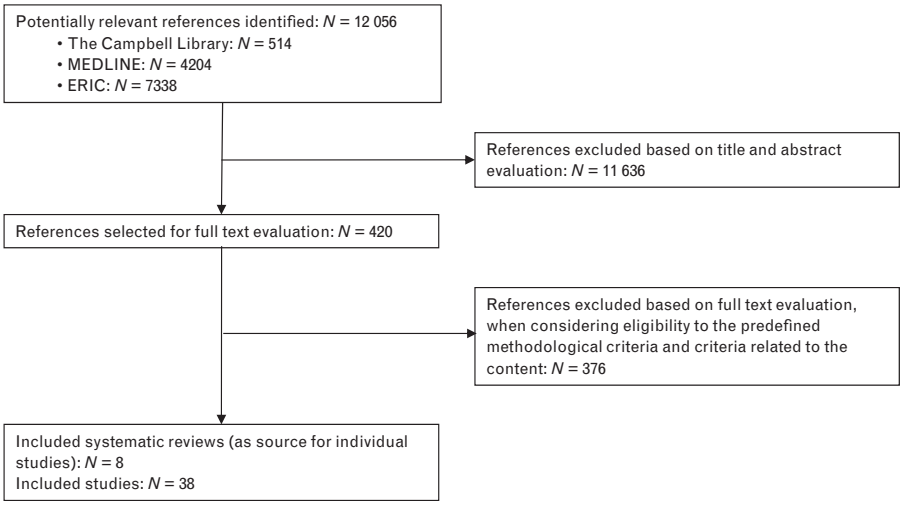

Figure 2. Study selection flowchart.

reduced the number of potentially eligible records to 420. Following evaluation of the full text, the total number of studies that met our inclusion criteria was reduced to eight existing systematic reviews[15–22] and 38 individual studies[23–60] (Fig. 2).

Scientific evidence is available for the following activities: book reading,[23–29] computer-assisted instruction,[30] indoor and outdoor kids games,[31–35] poetry reading or storytelling,[36–41] puzzle making,[42] puppetry,[43,44] doll as didactical tool,[45–47] road-safety education in practice,[48–51] role play,[52–54] singing,[31] storyboards,[55–57] block-building activities,[58] and visit to a library.[59,60] No evidence from studies with a controlled study design could be identified for the following three activities: craftwork, free expression and low-intensity sports activities (walking or cycling). In each target group (preschool children, primary school children), only two studies could be identified in which the didactical activity was provided by volunteers. Studies with at-risk children were included for only two of the activities with preschool children, whereas this was the case for three activities with primary school children. An overview of the available evidence is presented in Table 1 (preschool children) and Table 2 (primary school children), and for each didactical activity it is indicated if the study found a positive, a negative or no effect. Both tables include information about the population, the comparison and the overall quality of the evidence (according to the GRADE approach). For all the activities with preschool children, a positive effect was found for at least one of the outcomes studied. For the activities with primary school children, a positive effect was found for five out of eight activities for at least one of the outcomes studied. For the majority of the activities in both target groups, the level of evidence was found to be low to very low.

Discussion with stakeholders

We selected the didactical activities supported by evidence and discussed these with the stakeholder panel. They were instructed to focus particular attention on the applicability and meaningfulness of the activities that were described as effective. First, we presented the supporting evidence for each of the selected activities to the expert panel. Second, we used a self-developed decision tree to run the panel through a number of predefined decision points, outlined in Fig. 1. This process is further illustrated with two worked examples, including one on a 'recommended activity', where no barriers or obstacles related to the further implementation of the activity were identified, and one on a 'suggested activity', where some barriers were identified.

Example 1: block-building activities

The question raised for this activity was: 'In at-risk preschool children and primary school children in Flanders (Population), is making patterns with block-building activities accompanied by a nonprofessional adult (individual or in group) (Intervention) effective in improving knowledge, skills, attitude or behaviour (Outcome), when compared with no activity or another activity of interest (Comparison)?'. The search strategies used to search for relevant studies to answer this question can be found in Appendix 1.

Due to the lack of a direct comparison (i.e. block-building activities instructed by an adult compared with no block-building activities), all evidence describing

Table 1. Evidence table for interventions with preschool children

Intervention		Population					
Type	Guidance of the child	Solely at-risk children?	Age (years old)	Comparison	Effect	Number of included studies	Level of evidence[a]
Block-building activities	Teacher	No	5–6	Unstructured block-building activities	Positive effect on spatial skills, but depends on the measurement tool	1	Moderate
Book reading	Volunteer	Yes, at risk for reading difficulties	2–5	No book reading	Positive effect on listening comprehension skills and phonological sensitivity	1	Low
Kids' game: road safety education game	Researcher	No	4–5	No kids' game	Positive effect on knowledge of traffic safety (short-term and long-term) and short-term (not long-term) road-crossing behaviour	2	Low to very low
Kids' game: number game	Researcher	Yes	4–5	No kids' game	Positive effect on numeracy skills (short-term and long-term)	3	Very low
Poetry	Researcher/ teacher	No	3–5	No poetry or prose	Positive effect on literacy skills Negative effect on short-term comprehension skills	4	Very low
Puzzle making	Parent (own children)	No	2–4	No puzzle making	Positive effect on spatial transformation skills	1	Very low
Doll as didactical tool	Student	Yes, due to context of war	4–5	No doll	Positive effect on stress reactions during war	1	Moderate
Road safety education in practice	Volunteer/ researcher	No	4–7	No road safety training	Positive effect on short-term and long-term knowledge and behaviour	4	Very low
Singing	Researcher	No	4–5	No singing	Positive effect on knowledge of traffic safety No effect on road-crossing behaviour	1	Low

[a]Levels of evidence: moderate: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate; low: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate; very low: any estimate of effect is very uncertain.[13]

teacher-instructed versus block-building without instruction was retained. One study was eligible for inclusion: a randomized controlled trial (RCT) with preschool children, published by Casey *et al.*[58] This RCT evaluated the effect on spatial skills, measured by three different tests. Study characteristics and a synthesis of findings can be found in Appendix 3. In conclusion, positive effects of teacher-instructed block-building activities, when compared with unstructured activities, were described. A statistically significant improvement in spatial visualization was observed in the intervention group compared with the control group, as indicated by the block design

Table 2. Evidence table for interventions with primary school children

Intervention		Population					
Type	Guidance of the child	Solely at-risk children?	Age (years old)	Comparison	Effect	Number of included studies	Level of evidence[a]
Book reading	Volunteer	Yes, at risk for reading difficulties	6–12	No book reading	Positive effect on reading behaviour, decoding skills, reading fluency, reading rate, reading ability of language other than mother tongue	6	High to very low
					No effect on reading comprehension skills, reading accuracy, attitude and child behaviour	2	Moderate
Computer-assisted instruction	Volunteer	No	10–11	No computer-assisted instruction	Positive effect on long-term retention skills and self-efficacy	1	Very low
					No effect on short-term retention skills and reading motivation		
Role play	Researcher	No	6–12	No role play	Positive effect on social/moral cognition skills and knowledge	3	Low to very low
					No effect on attitude		
Poetry	(not described)	No	6–7	No poetry or prose	Positive effect on comprehension skills	2	Very low
					No effect on retention skills and literacy skills		
Puppetry	Teacher/ student	No	7–10	No puppetry	No effect on knowledge, attitude or behaviour	2	Low to very low
Doll as didactical tool	Teacher	No	7–11	No doll	No effect on behaviour	1	Low
Storyboard	Researcher/ teacher	No	6–14	No storyboard	Positive effect on knowledge, comprehension and retention skills	3	Moderate
Visit to a local library	Teacher	Yes, due to home background (nonnative children)	7–18	No visit to a local library	Limited and inconclusive scientific evidence on reading skills, attitude and behaviour	2	Very low

[a]Levels of evidence: high: further research is very unlikely to change our confidence in the estimate of effect; moderate: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate; low: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate; very low: any estimate of effect is very uncertain.[13]

score but not by block-building score and mental rotation score. The study population consisted of preschool children who are not specified as at risk (due to either socioeconomic status or learning difficulties). No high risk of bias could be found for this study, with only a lack of information concerning the allocation concealment. The final level of evidence was downgraded due to the indirect comparison and indirect intervention

(teacher-instructed versus volunteer-instructed), as described in the Methods section. The level of evidence was finally rated as moderate quality.

The expert panel *'recommended'* volunteer-instructed block-building activities for preschool children. This decision was based on the positive effects on spatial skills described by Casey *et al.*,[58] taking into account that evidence from one study is only limited, the feasibility of this activity for community volunteers within a Flemish school context, the expectation that this activity will yield beneficial outcomes in the target group and the absence of barriers or obstacles related to its further implementation in practice. The activity does not require a sophisticated level of training of volunteers, it was perceived as easy to organize and the costs are minimal.

Example 2: storyboarding

The question raised for this activity was: 'In at-risk preschool children and primary school children in Flanders (Population), does storyboarding accompanied by a nonprofessional adult (individual or in group) (Intervention) improve knowledge, skills, attitude or behaviour (Outcome), when compared with no storyboarding or another activity of interest (Control)?'. Storyboarding is a technique where a person moves pictures around on a (magnetic) board to tell a story or solve a problem.[61] Studies describing Kamishibai storyboards (a type of folk art common in Japan) or storyboards to create multimedia presentations, videos etc. were excluded as these were considered to be less appropriate for the target group. The search strategies used to search for relevant studies to answer this question can be found in Appendix 2.

Three studies were eligible for inclusion: one large ($n = 302$) and one small ($n = 27$) before–after study investigating the effect of storyboarding on knowledge concerning burn prevention,[55,56] and one non-RCT ($n = 192$) describing the effect of storyboarding on comprehension and retention skills.[57] All studies described effects with primary school children. Study characteristics and synthesis of findings can be found in Appendix 4.

In the two studies by Rieman and Kagan[55,56], it was demonstrated that storyboarding resulted in a statistically significant increase in knowledge (concerning burn prevention), compared with no storyboarding. Both publications by Rieman and Kagan describe a study with Amish students, so it may not be possible to extrapolate the results to the general population. The intervention was performed by a teacher and the study population consisted of primary school children who were not specified as at risk. No risk of bias could be found for the 2013 study, and lack of blinding was not specified in the 2012 study. The final level of evidence considering the effect of storyboarding on knowledge was downgraded due to the indirect comparison and indirect intervention (teacher-instructed versus volunteer-instructed) and finally rated as moderate quality.

In addition, there is conclusive evidence from a non-RCT on the effect of storyboarding on comprehension and retention skills.[57] In this experimental study by Rubman and Waters, it was demonstrated that storyboarding resulted in a statistically significant increase in comprehension and retention skills, compared with no storyboarding. Half of the study participants (i.e. 96 of 192 in total) were less skilled readers of primary school age. No high risk of bias could be found for this study, with only a lack of information concerning the allocation concealment. The intervention was not performed by a volunteer, but by the investigator, which resulted in a moderate level of evidence (indirect intervention).

The expert panel *'suggested'* volunteer-assisted storyboarding for primary school children. This decision was based on the positive effects described by Rieman and Kagan[55,56] and Rubman and Waters[57], the feasibility of this activity within a Flemish school context and the expectation that this activity will yield beneficial outcomes in the target group. However, the activity is suggested and not recommended, because the expert panel argued that there are potential obstacles related to training levels that might prevent schools from implementing the activity. The panel judged that to use storyboarding, volunteers would have to receive more specific guidance and instructions before they could implement it successfully.

Final guidance

Based on the best available evidence and the consensus judgment of the expert panel, the following activities were recommended to volunteers of the 'Bridging the Gap' project to support at-risk preschool children in the local school context: book reading, road-safety education game, number game, puzzle making, road-safety education in practice, singing and block-building activities. Reading a book and reading poetry are recommended for primary school children who are at risk of falling behind. In addition, some other activities are suggested for primary school children: computer-assisted instruction, storyboards and role play. A visit to a library was also suggested rather than recommended by the expert panel, because there was limited evidence to support its effectiveness in terms of reaching the desired outcomes. A detailed report on the guidance (in Dutch) is available upon request.

Discussion

In Belgium, the degree of educational inequality among schoolchildren is very high.[1] To minimize educational disadvantage and social exclusion, at-risk children should receive additional support to what is normally provided in (pre)schools.[4] One of the activities of the Belgian Red Cross is to provide support through volunteers. When choosing educational activities to carry out with these children, several aspects need to be taken into account, including effectiveness of the activity as proven in scientific studies, and issues related to its further implementation in practice. This article describes the development of evidence-based guidance in two steps: a systematic literature review to evaluate the effectiveness of the selected didactical activities and an assessment of the applicability (feasibility and appropriateness of the initiation of such activities by volunteers) and meaningfulness of these activities to the volunteer.

Our study took into account the target group and end users' opinions/preferences at multiple stages of the project. First, selection of the activities to be considered for inclusion in the literature review was based on the motivated advice of experts working in areas in which children are at risk of falling behind. Second, the applicability and meaningfulness of the activity performed by volunteers were considered when deciding which of the 16 potentially effective activities studied should be considered as recommended or suggested. Research questions focused on simple activities because backgrounds, experiences with supporting (at-risk) children and education may vary widely among community volunteers. In addition, the applicability of the activity being carried out by volunteers was taken into account when formulating the evidence-based recommendations. This was illustrated by the questions in the second part of the decision tree (Fig. 1) used by the multidisciplinary expert panel when making a decision about every activity.

The preselection of didactical activities by the panel based on relevance for the school context and the decision tree to facilitate the discussion were both perceived as time-savers. However, we also ran into some important limitations of the procedure. These are discussed in more detail below.

First, there is a lack of high-quality scientific evidence that meets our selection criteria. Evidence about a simple single intervention is lacking for many of the didactical activities. Three interventions were not quantitatively investigated and for seven interventions, only one study was available (Tables 1 and 2). In the majority of the studies, the interventions were not performed by volunteers but by teachers, researchers or parents who assist the children. We included them where necessary, but refer to them as indirect evidence (Tables 1 and 2). In addition to the quantity of studies, the available evidence was of low quality (Tables 1 and 2). The limited number of study participants was commonly used as a reason for downgrading the overall quality of the body of evidence, as it may result in imprecise results.

A second limitation is that our lead question is related to the effectiveness on personal development outcomes and specific activities, delivered by volunteers. As a consequence of this narrow focus, several important aspects were not taken into account. First, the effect of building a close supportive relationship with a 'mentor' on, for example children's self-esteem, was not taken into account. We focused on cognitive performance, but we don't know how the type of relationship the child builds with the volunteer could influence this. Second, our guidance targets community volunteers rather than parents or grandparents (who in certain contexts may also volunteer to work with vulnerable children). There is evidence that children benefit substantially from parents being actively involved in their education: in a study with more than 3000 children, involvement of both the father and mother at the age of seven is found to be an independent predictor of educational attainment by the age of 20.[62] Although parent participation was beyond the scope of the literature search, the expert panel acknowledged that parent-directed approaches leading to parent participation may be helpful to close the educational performance gap. Third, as a consequence of our narrow research question we did not identify any evidence that examined the needs and preferences of those who deliver the intervention (the community volunteers). However, we actively gave voice to the different stakeholders involved via the multidisciplinary expert panel. We started from the assumption that barriers and obstacles may differ between regions, for example because of variety in the school and healthcare system. Because of this risk in downplaying potential important local contextual factors, we decided to apply a context-specific approach when inviting local stakeholders to provide input.[63] Their expertise and experience was taken into account when formulating the recommendations.

The above-formulated limitations should be considered when formulating implications for research and practice.

Conclusion

Implications for research

The lack of high-quality scientific evidence results in several implications for future research. First, there is a need for further research to investigate the effectiveness

of single didactical interventions in at-risk children. Second, we suggest that future studies focus not only on the effects of activities as such, but also on the provider of the activity (either teachers, volunteers, parents or other people). Third, more evidence is needed on social and emotional aspects and the impact of a close relationship between the child and the community volunteer on the effectiveness of the didactical activities.

Implications for practice

The evidence-based guidance that we developed is currently being used in practice in Flanders and is integrated in the training of 'Bridging the Gap' volunteers by the Belgian Red Cross. In this training, we also provide practical tips that can help the volunteers perform the activities, such as discussing their approach with the respective teacher, working in line with themes being used in the class and asking the teacher for professional advice. Different brochures for different target groups (i.e. schools, volunteers) have been developed to recruit schools and volunteers for this project. In these brochures, we explain our scientific approach and we hope to convince as many stakeholders as possible to be involved in improving the personal development of at-risk children. In addition to the training of volunteers, a train-the-trainer package, in which trained volunteers will be asked to train other volunteers, is currently under development and will be tested in the near future. Our expert panel acknowledged the importance of parent participation, which is also taken into account in our project, as volunteers have the possibility to support children with their class work at home, and we advise involving the parents in this case.

We acknowledge that our guidance may not be readily transferable to all regions or settings. Local contextual factors could play a role in the success or failure of a certain activity (e.g. organizational support of volunteers, school characteristics, educational methods used by the school, the relationship between the volunteer and the child, etc.). We assume that our decision tree will support other teams in discussing the evidence base in relation to contextual factors encountered in practice. Since for many didactical activities no or only limited evidence was available, and contextual factors can also influence the success of an activity, it is important to communicate to our volunteers that the list of didactical activities included in the guidance is not exhaustive. Our core message is that volunteers should consider and test one or more activities included in the guidance. However, this does not mean that they need to limit themselves to the provided list of recommended and suggested activities. It is important that they can justify their choice and make a careful evaluation of their chosen approach, in collaboration with the school and in line with the methods applied by the school.

In conclusion, by disseminating this evidence-based guidance, we hope to encourage research institutes and schools to consider the research evidence on the didactical activities we have collected and to make use of the guidance we have formulated to facilitate the process of decision making.

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Conflicts of interest

E.D.B. and P.V. are in employment of the Belgian Red Cross. This work was made possible through funding from the Foundation for Scientific Research of the Belgian Red Cross. None of the authors or collaborators mentioned above declared any conflicts of interest.

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Appendix 1: Search strategies block-building activities

Campbell Collaboration (systematic reviews) using the search terms: ('lego'[all text] OR 'block'[all text] OR 'brick'[all text]) **AND** ('toy'[all text] OR 'kid'[all text])

MEDLINE (via PubMed interface) for systematic reviews, experimental and observational studies using the following search strategy:

1. 'child'[Mesh] OR 'infant'[Mesh] OR 'infant'[TIAB] OR 'infants'[TIAB] OR 'toddler'[TIAB] OR 'toddlers'[TIAB] OR 'preadolescent'[TIAB] OR 'preadolescents'[TIAB] OR 'child'[TIAB] OR 'children'[TIAB] OR 'preschooler'[TIAB] OR 'preschoolers'[TIAB] OR 'preschooler'[TIAB] OR 'preschoolers'[TIAB] OR 'schools'[Mesh] OR 'child day care centers'[Mesh] OR 'school'[TIAB] OR 'schools'[TIAB] OR 'preschool'[TIAB] OR 'preschools'[TIAB] OR 'preschool'[TIAB] OR 'preschools'[TIAB] OR 'kindergarten'[TIAB] OR 'kindergartens'[TIAB] OR 'prekindergarten'[TIAB] OR 'grade'[TIAB] OR 'parent-child relations'[Mesh] OR 'parenting'[Mesh]
2. (lego*[TIAB] OR block*[TIAB] OR brick*[TIAB]) **AND** ('toy'[TIAB] OR 'kid'[TIAB])
3. 1–2 AND

ERIC (via EBSCOhost) for systematic reviews, experimental and observational studies using the following search strategy:

1. DE 'young children' OR DE 'infants' OR DE 'toddlers' OR DE 'preadolescents' OR infant OR toddler OR preadolescent OR child OR children OR DE 'preschool Children' OR preschooler OR preschooler OR DE 'elementary schools' OR DE 'elementary school students' OR DE 'elementary education' OR DE 'primary education' OR school OR school-age OR DE 'kindergarten' OR kindergarten OR prekindergarten OR day-care OR daycare OR grade OR DE 'parenting styles'
2. (lego OR block OR brick) **AND** (toy OR kid)
3. 1–2 AND

Appendix 2: Search strategies story boards

Campbell Collaboration (systematic reviews) using the search terms: 'storyboard'[all text] OR 'storyboards'[all text] OR 'storyboarding'[all text] OR 'story-board'[all text] OR 'story-boards'[all text] OR 'story-boarding'[all text]

MEDLINE (via PubMed interface) for systematic reviews, experimental and observational studies using the following search strategy:

1. 'child'[Mesh] OR 'infant'[Mesh] OR 'infant'[TIAB] OR 'infants'[TIAB] OR 'toddler'[TIAB] OR 'toddlers'[TIAB] OR 'preadolescent'[TIAB] OR 'preadolescents'[TIAB] OR 'child'[TIAB] OR 'children'[TIAB] OR 'preschooler'[TIAB] OR 'preschoolers'[TIAB] OR 'preschooler'[TIAB] OR 'preschoolers'[TIAB] OR 'schools'[Mesh] OR 'child day care centers'[Mesh] OR 'school'[TIAB] OR 'schools'[TIAB] OR 'preschool'[TIAB] OR 'preschools'[TIAB] OR 'preschool'[TIAB] OR 'preschools'[TIAB] OR 'kindergarten'[TIAB] OR 'kindergartens'[TIAB] OR 'prekindergarten'[TIAB] OR 'grade'[TIAB] OR 'parent–child relations'[Mesh] OR 'parenting'[Mesh]
2. storyboard*[TIAB] OR story-board*[TIAB]
3. 1–2 AND

ERIC (via EBSCOhost) for systematic reviews, experimental and observational studies using the following search strategy:

1. DE 'young children' OR DE 'infants' OR DE 'toddlers' OR DE 'preadolescents' OR infant OR toddler OR preadolescent OR child OR children OR DE 'preschool Children' OR preschooler OR preschooler OR DE 'elementary schools' OR DE 'elementary school students' OR DE 'elementary education' OR DE 'primary education' OR school OR school-age OR DE 'kindergarten' OR kindergarten OR prekindergarten OR day-care OR daycare OR grade OR DE 'parenting styles'
2. storyboard OR storyboards OR storyboarding OR story-board OR story-boards OR story-boarding
3. 1–2 AND

Appendix 3: Study characteristics and synthesis of findings of quantitative evidence concerning block-building activities

Reference	Participants	Comparison	Outcome	Effect size
Casey *et al.* (2008)[58] USA Experimental study: RCT	147 (north-eastern urban city) and 153 (southwest urban city) of 5/6 years old (kindergarten) Remark: number of children in the experimental/control group was not described; number of boys was not described; students are from diverse ethnic, racial and socioeconomic backgrounds; children were not described as at risk for learning difficulties The Northeast urban school: -60% of the students were African American, 29% Hispanic, 8% white, 2% Asian, and 1% Native American -Median household income of $39 629 -73% of students qualified for free or reduced priced meals in 2006–2007 The Southwest urban school: -14% of the students were African American, 29% Hispanic, 48% white, 9% Asian, and 0% Native American -Median household income of $46 140 -37% of students qualified for free or reduced priced meals	Block-building activities (teacher-instructed i.e. introductory nonblock spatial activities followed by four block-building activities) versus Unstructured block-building activities (4 block-building sessions, but teachers implemented their regular mathematical curriculum without any supplemental structured lessons) Remark: both groups spent the same amount of time and used the same number and types of blocks	Spatial skills (measured by block-building score) Spatial skills (measured by block design score) Spatial skills (measured by mental rotation score)	Not statistically significant Northeast urban community: adjusted mean: 5.69 ± 1.64 (SD) versus 5.57 ± 1.63 (SD) Southwest urban community: adjusted mean: 6.27 ± 1.65 (SD) versus 6.19 ± 1.74 (SD) Statistically significant Northeast urban community: adjusted mean: 12.74 ± 5.30 (SD) versus 9.98 ± 5.14 (SD) Southwest urban community: adjusted mean: 12.03 ± 4.71 (SD) versus 9.97 ± 5.10 (SD) $P = 0.046$ in favour of intervention Not statistically significant: Northeast urban community: adjusted mean: 6.02 ± 2.38 (SD) versus 5.82 ± 2.30 (SD) Southwest urban community: adjusted mean: 7.79 ± 2.11 (SD) versus 7.32 ± 2.29 (SD)

RCT, randomized controlled trial.
[a]SD.

Appendix 4: Study characteristics and synthesis of findings of quantitative evidence concerning storyboarding

Reference	Participants	Comparison	Outcome	Effect size
Rieman and Kagan (2012)[56] USA (Pennsylvania) Experimental study: before–after study	27 children of 6–14 years old (grade 1–8) in one-room Amish school (15 boys) Remark: the children are Amish, no information concerning socioeconomic status is reported; children were not described as at-risk for learning difficulties	Storyboard versus No storyboard (i.e. before intervention)	Knowledge (about burn prevention) Long-term effect (2 months after pretesting)	Statistically significant 83% correct (67–97%) versus 62% correct (42–82%) $P < 0.0001$ in favour of intervention
Rieman and Kagan (2013)[55] USA (Pennsylvania) Experimental study: before-after study	302 children of 6–14 years old (grade 1–8) in one-room Amish school; 15 private Amish schools in eight states of USA; average size class was 21, with a maximum of 46 students Remark: the children are Amish, no information concerning socioeconomic status is reported; children were not described as at-risk for learning difficulties	Storyboard versus No storyboard (i.e. before intervention)	Knowledge (about burn prevention) Long-term effect (1 month after pretesting)	Statistically significant 85.3% correct (32.4–100%) versus 63.8% correct (17.6–100%) $P < 0.0001$ in favour of intervention
Rubman and Waters (2000)[57] USA (New York) Experimental study: nonrandomized controlled trial	192 children of 8/9 years old [grade 3 ($n = 96$, 48 boys and 48 girls)] and 11/12 years old [grade 6 ($n = 96$, 48 boys and 48 girls)] (96 skilled and 96 less skilled readers)	Storyboard versus No storyboard (only reading of the text)	Comprehension skills [as measured by questions concerning the content (i.e. inconsistent information in the stories)]	Statistically significant 2.33 versus 1.83, $F(1, 176) = 7.74$ $P < 0.006$ in favour of intervention
			Retention skills (short-term retention of story content, as measured by retelling the story)	Statistically significant $F(1, 176) = 10.04$ $P < 0.01$ in favour of intervention